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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/511,784

10/15/2004

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S697.12-0065

4209

27367 7590 02/03/2010  
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EXAMINER

GOFF II, JOHN L

ART UNIT

PAPER NUMBER

1791

MAIL DATE

DELIVERY MODE

02/03/2010

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/511,784	<b>Applicant(s)</b> PRIEDEMAN ET AL.	
	<b>Examiner</b> John L. Goff	<b>Art Unit</b> 1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 18 November 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,3-5,8,10,11,16,18-23,27,28,33 and 43-49 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-5,8,10,11,16,18-23,27,28,33 and 43-49 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 October 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                       | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>6/18/09, 11/18/09</u> .                                       | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

1. This action is in response to the amendment filed on 11/18/09.
2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

#### ***Claim Rejections - 35 USC § 103***

3. Claims 1, 3, 8, 10, 11, 16, 18, 19, 21, 22, 27, 28, 33, 43-45, and 47-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art (Specification pages 1-4 and 8 and optionally the Zinnel declaration submitted 11/18/09) as exemplified in part by Crump (U.S. Patent 5,121,329) in view of Joseph et al. (U.S. Patent 3,807,054) or Edmonds (U.S. Patent 5,448,838) and optionally Batchelder (U.S. Patent 5,652,925).

The admitted prior art discloses it was known to make a three-dimensional object by building an object from a thermoplastic modeling material using fused deposition molding wherein the built object has an object surface formed of the modeling material including an object surface formed of a plurality of layers as exemplified by Crump (Page 1, line 6 - Page 2, line 15 of the specification and Column 3, lines 64-66 of Crump). The admitted prior art further teaches that due to the layered manufacturing process the object surface formed of the modeling material exhibits at least one surface effect the effect considered to extend substantially across an entirety of the object because the layers extend substantially across an entirety of the object. The at least one surface effect such as a stair step effect, striation, or a surface roughness due to errors in building the object detracts aesthetically from the object wherein manual/by hand techniques

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were known for smoothing the object surface (Page 2, line 16 - Page 3, line 17 of the specification). Furthermore, due to the fused deposition modeling technique the object necessarily exhibits porosity as evidenced by the admitted prior art (See specifically the Zinniel declaration submitted 11/18/09) or Batchelder (Column 1, lines 31-41 and Column 2, lines 6-31). It is well known in the art that thermoplastic object surfaces formed as having a surface effect such as voids, cracks, scratches, and other surface roughness may be smoothed by exposing the object to vapors of a solvent such as methylene chloride that transiently softens the thermoplastic material at the object surface and reflows the softened thermoplastic material to uniformly smooth the object surface as shown by Joseph or Edmonds (Figure 6 and Column 1, lines 5-11 and Column 2, lines 3-11 and Column 4, lines 1-17 of Joseph and Figure 1 and Column 1, lines 6-14 and Column 2, lines 6-10 and 52-56 and Column 3, lines 1-8 of Edmonds), it being further noted the admitted prior art recognizes smoothing plastics with vapors of a solvent was known (Page 3, line 18 - Page 4, line 20 of the specification). It would have been obvious to one of ordinary skill in the art at the time the invention was made to smooth the object surface as taught by the admitted prior art as exemplified in part by Crump which surface necessarily exhibits porosity as optionally evidenced by the admitted prior art or Batchelder by using vapors of a solvent as was well known and shown by Joseph or Edmonds to easily and uniformly smooth the object surface across the entirety of the object without having to manually do so by hand wherein the smoothing reduces the porosity of the object at the object surface as Joseph expressly describes voids are filled by the smoothing and the materials and method taught by the admitted prior art as modified is the same as that discussed in the Zinniel declaration submitted 11/18/09 demonstrating the method necessarily reduces the porosity.

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Regarding claim 8, the length of time the object is exposed to the solvent vapors as taught by the admitted prior art as modified must be selected as a function of the concentration of the solvent vapors prior to exposing the object otherwise the uniformly smooth object surface would not be formed. In the event it is shown the length of time is not necessarily selected as a function of the concentration of the solvent vapors the following rejection would apply. It would have been obvious to one of ordinary skill in the art at the time the invention was made to select the length of time the object is exposed to the solvent vapors as taught by the admitted prior art as modified as a function of the concentration of the solvent vapors prior to exposing the object such that when the object is removed from the solvent vapors the surface is uniformly smooth.

Regarding claims 10, 27, 28, and 49, the admitted prior art discloses known solvent masking substances include gum, waxes, pastes, adhesives or masking tape (Page 8, lines 24-26). It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the admitted prior art as modified known solvent masking substances such as those shown by the admitted prior art as a function of inhibiting smoothing in areas where aesthetically surface roughness or other non-smoothing effect is desired wherein the specific technique for applying the substances which are similar to the thermoplastic molding material would have included the same fused deposition molding equipment as used to apply the thermoplastic molding material such that further equipment is not required.

Regarding claims 16 and 44, the admitted prior art as modified forms a uniformly smooth surface including filled voids and thus considered to eliminate the porosity of the object at the object surface. In the event the porosity is not necessarily eliminated the following rejection would apply. It would have been obvious to one of ordinary skill in the art at the time the

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invention was made to perform the step of smoothing the object surface in the admitted prior art as modified until the surface is completely smooth/non-porous only the expected result of forming a uniformly smooth surface being achieved.

Regarding claim 18 and 48, the object taught by the admitted prior art as modified is exposed the vapors of the solvent by suspending the object on a wire mesh within a chamber containing the vapors of the solvent in a manner that substantially allows the entirety of the object surface to be exposed to the vapors of the solvent as shown by Joseph (Column 2, lines 25-39). It is noted “suspending” is given its usual definition of to keep from falling as if by hanging. In the event it is shown the term “suspending” by itself requires the object to be hanging by an attachment above as opposed to as if by hanging the following rejection would apply. It would have been obvious to one of ordinary skill in the art at the time the invention was made place the object taught by the admitted prior art as modified in the chamber containing the vapors of the solvent using any means of placing an object in a chamber such as by hanging from an attachment above the object or by sitting on an attachment below the object as both would achieve the same result.

4. Claims 4, 5, 23, and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art as exemplified in part by Crump and Joseph or Edmonds and optionally Batchelder as applied to claims 1, 3, 8, 10, 11, 16, 18, 19, 21, 22, 27, 28, 33, 43-45, and 47-49 above, and further in view of Dahlin et al. (U.S. Patent 6,022,207).

The admitted prior art as modified above teaches all of the limitations in claims 4, 5, 23, and 46 except for a teaching of the specific thermoplastic material used, it being noted the admitted prior art makes reference to Dahlin as a known rapid prototyping technique. Dahlin

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directed to rapid prototyping similar to the admitted prior art discloses a particularly suitable thermoplastic is ABS (Column 4, lines 3-4). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use as the thermoplastic material in the admitted prior art as modified ABS a known suitable material such as shown by Dahlin.

5. Claims 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art as exemplified in part by Crump and Joseph or Edmonds and optionally Batchelder as applied to claims 1, 3, 8, 10, 11, 16, 18, 19, 21, 22, 27, 28, 33, 43-45, and 47-49 above, and further in view of Leyden et al. (U.S. Patent 5,143,663).

The admitted prior art as modified teaches all of the limitations in claim 20 except for a teaching of modifying an initial object representation to pre-distort certain features of the surface geometry, it being noted the admitted prior art discloses the fused deposition molding equipment includes a computer aided machine (CAM) operating in conjunction with a computer aided design procedure (CAD) as exemplified in Crump (Column 1, lines 15-24) which computers are considered to create a digital representation of the final three-dimensional object and control the fused deposition molding equipment to form the final three-dimensional object from a provided initial object representation in a digital format wherein the initial object representation has a surface geometry, the object built in the building step has a geometry defined according to the object representation, and the geometry attained following the exposing step approximately matches that of the initial object representation. The admitted prior art makes reference to Leyden as a known rapid prototyping technique. Leyden directed to rapid prototyping similar to the admitted prior art discloses the object is built oversize so that after the surface roughness is removed the object will be the right size (Column 7, lines 25-36). It would have been obvious to

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one of ordinary skill in the art at the time the invention was made to include in the admitted prior art as modified a step of modifying the initial object representation to pre-distort certain features of the surface geometry so that after the surface roughness is removed the object will be the right size as shown by Leyden.

6. Claims 18 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art as exemplified in part by Crump and Joseph or Edmonds and optionally Batchelder as applied to claims 1, 3, 8, 10, 11, 16, 18, 19, 21, 22, 27, 28, 33, 43-45, and 47-49 above, and further in view of Gessner (U.S. Patent 4,983,223).

As noted above, the object taught by the admitted prior art as modified is exposed to the vapors of the solvent by suspending the object on a wire mesh within a chamber containing the vapors of the solvent in a manner that substantially allows the entirety of the object surface to be exposed to the vapors of the solvent as shown by Joseph. It is noted "suspending" is given its usual definition of to keep from falling as if by hanging. In the event it is shown the term "suspending" by itself requires the object to be hanging by an attachment above as opposed to as if by hanging the following rejection would apply. It was known in the art to expose an object to vapors of a solvent by suspending the object in the vapors by hanging as shown by Gessner wherein suspending the object as shown by Gessner allows the process to be conducted in a such a manner that the solvent vapors are discharged into the atmosphere at a level much less than is conventional (Column 5, lines 59-63 and Column 6, lines 47-59). It would have been obvious to one of ordinary skill in the art at the time the invention was made to expose the object to the vapors of the solvent as taught by the admitted prior art as modified using a conveyor wherein the object is hanging as shown by Gessner whereby the object surfaces are exposed to the vapors



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of the solvent with the solvent vapors discharged into the atmosphere being much less than is conventional.

***Response to Arguments***

7. Applicant's arguments with respect to claims 1, 3-5, 8, 10, 11, 16, 18-23, 27, 28, 33, 43-49 have been considered but are moot in view of the new ground(s) of rejection.

Applicants argue,

“In comparison, conventional smoothing techniques, such as trimming, machining, grinding, and sanding, may not necessarily reduce porosity since these techniques do not reflow the modeling material.” and

“Furthermore, the plastic articles that are smoothed pursuant to Joseph and Edmonds are typically built from an injection molding or similar technique, and do not exhibit such porosity issues.”. and

“This combination of exposing the object to solvent vapors/reflowing the softened modeling material with the use of a 3D object built with a fused deposition modeling technique provides porosity-reduction characteristics that are not present in, nor recognized by, the teachings of the cited references.”.

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Initially it is noted the Zinniel declaration submitted 11/18/09 has been reviewed and considered. The admitted prior art as exemplified by Crump teaches the layered techniques of the current art result in at least one surface effect such as a stair step effect, striation, or a surface roughness due to errors in building the object that detracts aesthetically from the object wherein manual/by hand techniques were known for smoothing the object surface. The admitted prior art as exemplified by Crump does not expressly describe the object as exhibiting porosity.

However, porosity is an inherent result of the layered techniques as evidenced by the Zinniel declaration and Batchelder. It is well known in the art that thermoplastic object surfaces formed as having a surface effect such as voids, cracks, scratches, and other surface roughness may be smoothed by exposing the object to vapors of a solvent that transiently softens the thermoplastic material at the object surface and reflows the softened thermoplastic material to uniformly smooth the object surface as shown by Joseph or Edmonds, it being further noted the admitted prior art recognizes smoothing plastics with vapors of a solvent was known. Thus, it would have been obvious to use the smoothing technique taught by Joseph or Edmonds in the admitted prior art as exemplified by Crump to remove the surface effects and form a uniformly smooth surface. Joseph does teach the technique fills voids which appears to necessarily teach reducing the porosity of the object at the object surface. However, even if the reduction in porosity is considered not expressly described the Zinniel declaration demonstrates that the admitted prior art as modified necessarily results in the reduced porosity. In summary, the reduction in porosity as claimed by applicants is not an unexpected result sufficient to overcome the prior art as applied because using a solvent vapor smoothing process in the admitted prior art as exemplified by Crump is obvious in view of Joseph or Edmonds to solve an art recognized problem expressly

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disclosed in the admitted prior art as exemplified by Crump wherein both the exhibited porosity and reduction in porosity necessarily result from the combination.

### ***Conclusion***

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **John L. Goff** whose telephone number is **(571)272-1216**. The examiner can normally be reached on M-F (7:15 AM - 3:45 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Crispino can be reached on (571) 272-1226. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/John L. Goff/  
Primary Examiner, Art Unit 1791